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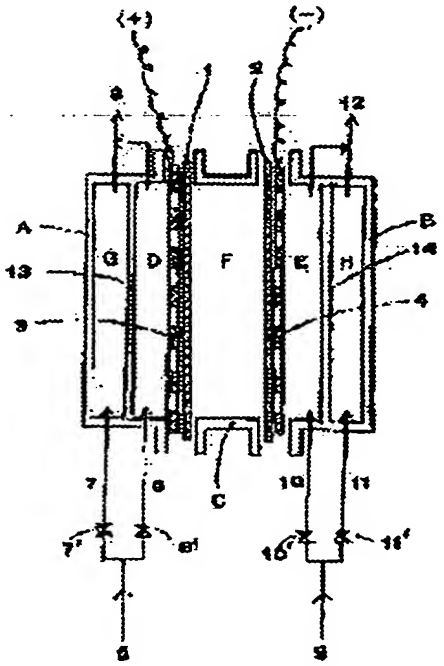

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CLAIMS

[Claim(s)]
[Claim 1] It has the cell which prepared the anode plate room which has arranged the anode plate, and the cathode room which has arranged the negative plate. And make it shunt the raw water supplied to an anode plate side toward the water which carries out

electrolysis processing, and the water which does not carry out electrolysis processing. Make an anode plate room let flow the water which carries out electrolysis processing, and the water discharged from the anode plate room is made into the structure made to join the above-mentioned water which does not carry out electrolysis processing. Moreover, make it shunt the raw water supplied to a cathode side toward the water which carries out electrolysis processing, and the water which does not carry out electrolysis processing. Make a cathode room let flow the water which carries out electrolysis processing, and water is electrolyzed using the water electrolyzer which made the water discharged from the cathode room the structure made to join the above-mentioned water which does not carry out electrolysis processing. It is the method of manufacturing the acid electrolysis water of pH 2.0-3.0, and the alkaline electrolysis water of pH 10.5-12.0. an electrolyte is existed in the water which carries out electrolysis processing -- making -- an anode plate and a negative plate -- electrolysis processing -- the electrolysis water manufacturing method characterized by carrying out the load of the direct current 1500C [per 1l. of service water] or more

[Claim 2] The electrolysis water manufacturing method according to claim 1 which prepares an anode plate room, a middle room, and a cathode room, contains an electrolytic solution in a middle room, and is characterized by supplying the this contained electrolytic solution to the water which carries out electrolysis processing by electrophoresis when a cell divides with the diaphragm of two sheets.

[Claim 3] The electrolysis water manufacturing method characterized by to let flow the water which lets flow the water which carries out electrolysis processing to the loculus in which an electrode board exists, and does not carry out electrolysis processing to the loculus in which an electrode board does not exist using the water electrolyzer equipped with the cell which divided each loculus of an anode plate room and a cathode room with the dashboard into the loculus in which an electrode board exists further, and the loculus in which an electrode board does not exist in the electrolysis water manufacturing method according to claim 2.

[Claim 4] By keeping an interval and arranging an anode plate, the diaphragm of two sheets, and a negative plate one by one The water electrolyzer equipped with the cell which prepared the water flow way surrounded by the water flow way and negative plate which were surrounded by the cathode room and **** which were divided with the anode plate room and negative plate which were divided with the anode plate and the diaphragm, and the diaphragm, and the anode plate, and **** is used. And it is the electrolysis water manufacturing method according to claim 1 characterized by making each loculus of the above-mentioned anode plate room and the above-mentioned cathode room let flow the water which carries out electrolysis processing, and the water which does not carry out electrolysis processing making each above-mentioned water flow way let flow.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention electrolyzes water and relates to the method of manufacturing acid electrolysis water and alkaline electrolysis water.

[0002]

[Description of the Prior Art] Electrolyzing the water which added the chlorine-based electrolyte of a small amount, and making acid electrolysis water and alkaline electrolysis water generate is performed conventionally. Conventional acid electrolysis water has hydrogen ion concentration (pH) in the range of 2.0-3.5 (generally 2.4-2.7), and oxidation reduction potential (ORP) shows more than 1100V, and contains a free chlorine 10 ppm or more. Thus, since acid electrolysis water contains a free chlorine and presents strong acid and high oxidation reduction potential, it has the powerful sterilization effect to Escherichia coli, various kinds of bacteria, or the bacterium, and is beginning to be widely used in a medical field, an agricultural field, a dairy field, etc. in recent years. moreover, since the ranges of pH are 10.5-12.0 and it presents strong alkalinity, having sterilizing properties too and having a strong detergency to the dirt which contains an oil content and protein simultaneously knows alkaline electrolysis water -- having -- **** -- washing of vegetables, fruit, a zootechnics article, or a fishery article, and washing of a machine part or electronic material -- a use new as service water is coming out

[0003] In order to manufacture these acid electrolysis water and alkaline electrolysis water by the electrolysis of water The water electrolyzer of structure which divided into the anode plate room and the cathode room by the diaphragm is used. The method of letting flow and electrolyzing into an anode plate room and a cathode room the raw water which added the electrolyte beforehand, A high concentration electrolysis room is filled up with the diaphragm of two sheets into a middle room using the water electrolyzer of structure which divided into the anode plate room, the middle room, and the cathode room, and the method of letting flow and electrolyzing raw water into an anode plate room and a cathode room etc. is adopted.

[0004] Even if it carries out a deer, it makes it acid electrolysis water and it makes it alkaline electrolysis water, the property and composition which are demanded greatly change with the purpose which uses it, or uses. For example, although the free-chlorine concentration which influences the sterilization force of water is the most important when using acid electrolysis water for medical-application ways, such as disinfection of an endoscope, even if the electrolyte concentration to contain is high, it is not a problem so much. On the other hand, when using acid electrolysis water for an agricultural use, the salinity concentration to contain must be low. Moreover, it will become a problem if an odor is too strong when using it for the sterilization and gargling in a mouth with dentistry etc. Moreover, depending on the kind of metal currently used in the case of sterilization or washing, generating of rust poses a problem. Thus, although the demand of the user to acid electrolysis water and alkaline electrolysis water was various, in order to correspond to those demands, the fundamental design specification of the electrolyzer needed to be changed former each time.

[0005] Moreover, conventional water is electrolyzed and there is a trouble of many ** in the manufacture method of acid electrolysis water or alkaline electrolysis water. That is, (1) electrolysis efficiency is bad and there is much power consumption. (2) The free-chlorine concentration which acid electrolysis water contains cannot become high easily, and adjustment of concentration is not easy. (3) Salt damage will be started if it is mostly

used for the cause and agricultural products of rust for a long period of time, the electrolyte, i.e., the salinity, contained in acid electrolysis water or alkaline electrolysis water. (4) It is easy to generate the trouble in which a scale adheres to cathode by electrolysis.

[0006] In the conventional manufacture method, although some causes with much [the electrolysis efficiency of (1) is bad and] power consumption in it are considered Since one is electrolyzed into water where a little electrolyte is added, the conductivity of solution is low, Only the ion in which electrolysis exists near an anode plate or the cathode two bypasses the solution of most which delivers an electron on an electrode front face and is supplied to an electrolyzer, without contributing to electrolysis, and it is discharged, A part of hydrogen ion which a part of ion electrolyzed into 3 ** passed the diaphragm, and it moved to the counter electrode side, namely, was generated by the anode plate moves to cathode, and the hydroxide ion generated by cathode moves to an anode plate, The ion concentration of an anolyte is that the transfusion phenomenon of water happens toward an anode plate to cathode in four at a low case etc. As for the amount of theoretical current calculated as a result, for example, Faraday's law required for pH value to generate the acid electrolysis water of 2.7, it is general to require l. in 600 or 1000C /in fact to being 192C/l.

[0007] Moreover, the above-mentioned cause of (2) is considered that the electrolysis reaction in an anode plate has low generation of the following chloric-acid ion from which the electrolyte concentration to add follows generation and it of chlorine gas to a low sake although the reaction of the chloride ion contained in water and an electrolyte competes, and acid electrolysis underwater free-chlorine concentration does not become high. Therefore, although oxides which have the catalyst effect as an electrode material for anode plates, such as iridium and palladium, are used to raise the generating efficiency of a free chlorine as a cure conventionally, it is very expensive and it is difficult to adjust free-chlorine concentration freely. Moreover, although the concentration of a free chlorine can be raised to some extent if the amount of the electrolyte to add is increased, generation underwater salinity concentration is made increased increasingly, and the problem of the above-mentioned **** (3) arises. Although generation underwater salinity concentration originally has not been exceeded to a low, in the conventional generation method, it is 1200 ppm in 600 or salinity concentration.

[0008] Furthermore, the above-mentioned problem of (4) is that the components for magnesium, such as calcium, etc. contained in water by electrolysis adhere to a negative plate as a scale, and the electric resistance of an electrode increases by the scale buildup, a diaphragm carries out blinding, or it serves as a serious trouble of the flow of water being checked. Complicated means -- the cure against a scale changes the polarity of cathode and an anode plate in the middle of electrolysis, or dissolves it by the acidic solution -- were taken conventionally.

[0009]

Technical problem

[Problem(s) to be Solved by the Invention] By having been made in view of the above-mentioned situation, and devising the water flow method of water, the addition method of electrolyte solution, and the load of a direct current in electrolyzing water and manufacturing acid electrolysis water and alkaline electrolysis water, this invention has

little power consumption, is excellent in the generating efficiency of a free chlorine, and aims at offering the method that the scale buildup to cathode can be prevented.
[0010]
[Means for Solving the Problem] The free-chlorine concentration which (2) acid electrolysis water with much [(1) electrolysis efficiency which is the conventional trouble is bad, and] power consumption in it contains for this invention person to make the above-mentioned purpose attain as a result of advancing research could not become high easily, and it predicted that it has a problem in the method of electrolysis that all there is it, much the electrolyte, i.e., the salinity, contained in (3) acid electrolysis water and the alkaline electrolysis water adjustment of concentration is not easy water, etc. And although raw water is let flow and electrolyzed into the whole-quantity cell by the conventional method in order that the acid electrolysis water which pH shows the range of 2.0 to 3.5, and pH may obtain the alkaline electrolysis water in which 10.5 to 12.0 is shown as a result of studying the solution method That delivered and received the electrode and the electron in practice by this method, and the electrolysis reaction has contributed It is bypassed and discharged only with the inner small kana water, without remaining most contributing to electrolysis, the electrolysis which introduces most electrolytes added into a cell with it there paying attention to being discharged without contributing to electrolysis similarly -- by restricting amount of water a little, making an electrolyte exist in this, and electrolyzing by the heavy load By that the above-mentioned problem is solvable and adoption of this means, the knowledge of the ability to also cancel the trouble of a scale buildup over the cathode of (4) was carried out, and this invention was completed.
[0011] Namely, this invention is equipped with the cell which prepared the anode plate room which has arranged the anode plate, and the cathode room which has arranged the negative plate. And make it shunt the raw water supplied to an anode plate side toward the water which carries out electrolysis processing, and the water which does not carry out electrolysis processing. Make an anode plate room let flow the water which carries out electrolysis processing, and the water discharged from the anode plate room is made into the structure made to join the above-mentioned water which does not carry out electrolysis processing. Moreover, make it shunt the raw water supplied to a cathode side toward the water which carries out electrolysis processing, and the water which does not carry out electrolysis processing. Make a cathode room let flow the water which carries out electrolysis processing, and water is electrolyzed using the water electrolyzer which made the water discharged from the cathode room the structure made to join the above-mentioned water which does not carry out electrolysis processing. It is the method of manufacturing the acid electrolysis water of pH 2.0-3.0, and the alkaline electrolysis water of pH 10.5-12.0. an electrolyte is existed in the water which carries out electrolysis processing -- making -- an anode plate and a negative plate -- electrolysis processing -- it is the electrolysis water manufacturing method characterized by carrying out the load of the direct current 1500C [per 1l. of service water] or more
[0012] In short, this invention differs from the conventional method which lets flow and electrolyzes the whole quantity of raw water into an anode plate room and a cathode room. Let a part of raw water flow in an anode plate room and a cathode room, and high-concentration strong acid nature electrolysis water and strong-base nature electrolysis water are made to generate by making remarkably abundant conventionally the amount of

direct currents per electrolysis duty of water, and electrolyzing it. It is the method of obtaining the acid electrolysis water (pH 2.0-3.0) and alkaline electrolysis water (pH 10.5-12.0) of the concentration which is mixed with raw water, dilutes this high-concentration strong acid nature electrolysis water and strong-base nature electrolysis water after that, and is made into the purpose.

[0013]

[Embodiments of the Invention] this invention method is electrolysis equipment equipped with the cell which prepared the anode plate room which has arranged the anode plate, and the cathode room which has arranged the negative plate. And make it shunt the raw water supplied to an anode plate side toward the water which carries out electrolysis processing, and the water which does not carry out electrolysis processing. Make an anode plate room let flow the water which carries out electrolysis processing, and the water discharged from the anode plate room is made into the structure made to join the above-mentioned water which does not carry out electrolysis processing. Moreover, make it shunt toward the water which carries out electrolysis processing of the raw water supplied to a cathode side, and the water which does not carry out electrolysis processing, a cathode room is made to let flow the water which carries out electrolysis processing, and it carries out using the water electrolysis equipment which made the water discharged from the cathode room the structure made to join the above-mentioned water which does not carry out electrolysis processing. Drawing 1 - drawing 4 are what illustrated the water electrolysis equipment of this structure, and are a cross section, respectively.

[0014] Drawing 1 is the cross section of water electrolysis equipment equipped with the cell which prepared the anode plate room, the middle room, and the cathode room by dividing with the diaphragm of two sheets. It is the example which carries out claim 2 invention. (A), (B), and (C) are the walls of a cell, respectively. This cell is divided into the anode plate room (D), the middle room (F), and the cathode room (E) by a diaphragm (1) and (2). (3) And (4) is an electrode board, an electrode board (3) is an anode plate and an electrode board (4) is cathode. Many holes have opened to each electrode board. Although you may stick even if separated from the electrode board (3), a diaphragm (1) and an electrode board (4), and the diaphragm (2), when showing and sticking the case where it has stuck, as for drawing 1 , it is desirable to insert the non-electrical conducting material of the shape of a sheet in which the same hole opened with each electrode board between each electrode board and each diaphragm. the raw water by the side of an anode plate (5) is shunted toward the water (6) which carries out electrolysis processing, and the water (7) which does not carry out electrolysis processing (the water which carries out electrolysis processing hereafter -- electrolysis -- it may be called service water) The water (6) which carries out electrolysis processing lets an anode plate room (D) flow, joins the water (7) by which electrolysis processing was carried out and which does not carry out post-electrolysis processing, is diluted, and turns into predetermined acid electrolysis water (8) of pH 2.0-3.0. On the other hand, the raw water by the side of cathode (9) is shunted toward the water (10) which carries out electrolysis processing, and the water (11) which does not carry out electrolysis processing. The water (10) which carries out electrolysis processing lets a cathode room (E) flow, joins the water (11) by which electrolysis processing was carried out and which does not carry out post-electrolysis processing, is diluted, and turns into predetermined alkaline electrolysis water (12) of pH 10.5-12.0.

[0015] (6') And (10') (11') it is a bulb for adjusting amount of water, respectively (7'). A middle room (F) is filled up with high-concentration electrolyte solution. Usually, 10% or more of solution of potassium chloride or a sodium chloride may be used, and you may feed from the electrolyte solution tank formed independently using a pump etc. Electrolyte concentration may be high how much, unless the fluidity of solution is barred. moreover, the electrolysis in the case of this example -- although the water flow method of of service water (6) and (10) may be introduced from the lower entrance of an anode plate room and a cathode room and may take out the generation water and gas after electrolysis from an up outlet, from the hole for upside outlets, it may be made to replace by the generation water after electrolysis, and gas, and may be introduced the electrolysis in this case of making it replace and making it introduce -- the amount of water flow of service water is a value near the capacity of the gas which occurs in an anode plate and cathode, and serves as the minimum value calculated by (a) and the (b) formula which are mentioned later

[0016] the electrolysis which lets water flow in the anode plate room (D) and cathode room (E) for electrolysis -- the electrolysis duty of water of service water (6) and (10) is an amount shown by (a) and the (b) formula which are mentioned later, in the case of the current load of 1A (ampere), the peak is a part for 40ml/, and the value turns into a value counted backward from l. in 1500C / If it electrolyzes the above condition, in an anode plate side, anions, such as a chloride ion contained in the electrolyte solution with which it was filled up in the middle room (F), will move by electrophoresis into an anode plate room (D) based on the transference number of each ion, an anion and water will be electrolyzed in an electrode front face, and gas, such as 1.9 or less strong acid nature electrolysis water and oxygen, and chlorine, will generate [pH value]. This strong acid nature electrolysis water is discharged from an anode plate room (D), the water (7) by which electrolysis processing is not carried out is joined, and the acid electrolysis water (8) which has the target pH value (pH 2.0-3.0) is generated. On the other hand, in a cathode side, cations, such as sodium ion contained in the electrolyte solution with which it was filled up in the middle room (F), move to the cathode interior of a room based on the transference number of each ion, a cation and water are electrolyzed in an electrode front face, and gas, such as 12.1 or more strong-base nature electrolysis water and hydrogen, generates [pH value]. This strong-base nature electrolysis water is discharged from a cathode room (E), the water (11) by which electrolysis processing is not carried out is joined, and the alkaline electrolysis water (12) which has the target pH value (pH 10.5-12.0) is generated.

[0017] In this invention, the load of the direct current 1500C [/l.] or more is carried out to the electrolysis duty of water. If this load is counted backward, the maximum of the electrolysis duty of water in the case of the current value of 1A will become 40ml. The reason for carrying out the load of the direct current 1500C [/l.] or more is from that it was the value of 1500C/l. or more, that the phenomenon in which the generation efficiency of a free chlorine increased by l. in 1500C /or more was shown, and a scale buildup [in / cathode / in 1500C /or more] not having been seen by l., as a result of investigating a current burden required to prevent the transfusion phenomenon of the water which is one of the causes to which electrolysis efficiency is reduced. And as mentioned above, the pH value of the strong acid nature electrolysis water generated in the anode plate interior of a room's at the time of a 1500C [/l.] or more current load

becomes 1.9 or less, and 12.1 or more are the pH value of the strong-base nature electrolysis water of the cathode interior of a room.

[0018] And the minimum value of this electrolysis duty of water is the amount which is sufficient for replacing the gas generated in an anode plate and cathode at the time of electrolysis, i.e., the amount approximated to the amount of gas generation calculable [with Faraday's law]. Incidentally it is current of 1A (ampere) calculated by Faraday's law, and the yield of the gas in the anode plate in reference condition is a part for 3.49ml/, and the yield of the gas in cathode is a part for 6.98ml/. If the above conditions are summarized as a simple formula, the range the minimum [of the electrolysis duty of water] - greatest will become the formula of the following (a) and (b).

Anode plate side electrolysis duty-of-water (part for milliliter/) =3.5xA-40xA ... (a)

Cathode side electrolysis duty-of-water (part for milliliter/) =7.0xA-40xA ... (b)

(However, A is the amount of electrolysis current)

The strong acid nature electrolysis water and strong-base nature electrolysis water which were described above by carrying out water electrolysis processing within the limits of this can be made to generate. And the target acid electrolysis water and target alkaline electrolysis water of pH value can be obtained by mixing this generated strong acid nature electrolysis water and strong-base nature electrolysis water with the water by which electrolysis processing is not carried out.

[0019] next, electrolysis -- pH-value control can be performed easily, the free-chlorine concentration contained in acid electrolysis underwater is raised, and by mixing with the water which carries out the load of the direct current 1500C [/l.] or more to service water, and does not carry out electrolysis processing after that, and diluting explains the reason which a power efficiency can improve first, a mixing ratio with the water in which the reason which pH value can adjust easily does not carry out electrolysis processing -- it is because a change of a rate can be made freely, without changing electrolysis conditions That is, specifically, the desired acid electrolysis water and desired alkaline electrolysis water of pH value can be easily obtained by adjusting a bulb (10') and (11') by the cathode side again by adjusting a bulb (6') and (7') about an anode plate side in drawing 1 .

[0020] Next, why the free-chlorine concentration contained in acid electrolysis underwater is raised is explained. The anode plate side electrolysis duty of water in this invention is an amount (a part for milliliter/) which multiplied current (ampere) by 40 at the maximum. If this counts backward, the current which carries out a load to the water per l./m will be 25A or more, and the current burden of electrolysis will be a very high value compared with the conventional conditions. Consequently, the chloride-ion concentration of the anode plate interior of a room serves as a high value compared with the conventional method.

[0021] It is as follows when the typical electrode reaction formula which happens on an anode plate front face is shown here.

$2H_2O-4e^- \rightarrow O_2+4H^+$ ..... (c)

$2Cl(s)^- -2e^- \rightarrow Cl_2$ ..... (d)

If the reaction of (c) is decomposed and considered here, water will dissociate to a hydrogen ion and a hydroxide ion first, and it will be thought that it passes through process in which an electron is taken by electrode reaction and a hydroxide ion turns into oxygen gas and a hydrogen ion.

$4H_2O <=> 4H^+ + 4OH^-$ ..... (e)
$4OH^- \rightarrow O_2 + 2H_2O$ ..... (f)
Therefore, the reaction of (c) and (d) competes in an electrode front face, and the concentration of OH~ion which exists near the electrode front face as a factor, and Cl~ion which governs a reaction rate involves greatly. So, when the chloride-ion concentration of the anode plate interior of a room is high like this invention, chlorine gas can be generated by the ratio higher than the conventional method.
[0022] Moreover, the chlorine gas which occurred reacts with water further, and generates a strong hypochlorous acid, a strong hypochlorite, etc. of sterilizing properties.
$Cl_2 + H_2O <=> HCl + HClO$ .... (g)
$HClO <=> H^+ + ClO^-$ ..... (h)
the method of this invention not only being easily raised in free-chlorine concentration but electrolysis -- free-chlorine concentration can be easily adjusted by changing a ratio with the water (7) in which the amount of service water (6) does not carry out change and electrolysis processing namely, electrolysis -- the time of making the amount of service water (6) into the minimum value of the (a) formula -- free-chlorine concentration -- most -- high -- becoming -- electrolysis -- the amount of service water (6) is increased -- it is alike, and it can follow and free-chlorine concentration can be made low Moreover, although the electrode material for anode plates may use an expensive platiniridium, expensive palladium, etc. which are generally used in case the acid electrolysis water of high free-chlorine concentration is manufactured, if it is the conditions which raise the free-chlorine concentration of this invention, the electrode material which carried out platinum plating can also obtain high free-chlorine concentration to titanium.
[0023] Next, the reason which a power efficiency can improve is explained. like the above-mentioned -- this invention -- the electrolysis duty of water -- receiving -- a current burden -- high -- an anode plate room and a cathode room -- setting -- electrolysis -- service water -- since inner ion concentration and inner electric electric conductivity are high, the voltage at the time of electrolysis can be lowered, consequently power consumption can be made low Moreover, since underwater ion concentration increases, the transfusion phenomenon which a moisture child moves toward cathode from an anode plate can be suppressed.
[0024] Next, the reason for decreasing the scale-buildup phenomenon over cathode is explained. The main electrolysis reactions performed in cathode are as follows.
$2H_2O + 2e^- \rightarrow H_2 + 2OH^-$ ..... (i)
$Na^+ + e^- \rightarrow Na$ ..... (j)
$2Na + 2H_2O \rightarrow 2Na^+ + 2OH^- + H_2$ .. (k)
Like the above-mentioned reaction formula, by cathode, metal ions, such as sodium, are returned with generating of a hydroxide ion and hydrogen gas, it once becomes a metal, and water and the phenomenon of reacting happen further. If ion, such as calcium, magnesium, and a silica, exists underwater at this time, it is returned at a reaction with the same said of those ion, and in order that it may be metalized or components, such as calcium and magnesium, may generate a hydroxide, these will often carry out deposition to an electrode front face as a scale.
[0025] Thus, the phenomenon in which a scale adheres to cathode from the former in the case of the electrolysis of water is considered as an unescapable thing, the hardness component contained in raw water, using a water softener etc. as a cure against

antisticking is removed, or the becoming measures from which the scale adhering to the electrode is washed from an acid and which it becomes [measures], reverse the polarity of an electrode and make a scale exfoliate are taken. the electrolysis which lets water flow in the cathode room in the case of generating alkaline electrolysis water by electrolysis by the conventional method -- although the amount of current which carries out a load to service water so much is about (720C/(l.)) 12A per l./m about, often depositing on the surface of a negative plate in the case of this condition, and becoming a scale is observed Visual observation of the electrode front face of electrolysis is carried out using the cell which made the side attachment wall of a cathode room with a transparent material using the electrode given in a JP,8-276184,A official report mentioned later. As a result of studying the conditions which do not deposit a scale in cathode, the amount of water flow is received. 1500C/l. or more When the load of the current 1800C [/l.] or more was carried out preferably and pH of a cathode room was made into 12.1 or more strong-base nature, it checked that a scale did not deposit on an electrode front face. It is surmised that this reason is because many scale components are dissolved or it is hard to deposit a crystal under strong-base conditions. Furthermore, compared with the diaphragm by the side of an anode plate, the direction of the ion permeability of the diaphragm by the side of cathode chooses a large thing, and keeping acid the pH value of the solution of the middle interior of a room also has the effect which prevents generating of a scale.

[0026] Drawing 2 is the cross section of the cell which transformed drawing 1 . Although the cell of drawing 1 is a cell made to stick each electrode board (3) and (4) to each diaphragm (1) and (2) using the electrode board with which many holes opened as the electrode board (3) of an anode plate, and an electrode board (4) of cathode The usual electrode board with which the hole has not opened as the electrode board (3) of an anode plate as shown in drawing 2 , and an electrode board (4) of cathode is used. Water is electrolyzed using the cell which has arranged each electrode board (3) and (4) in the position distant from each diaphragm (1) and (2), electrolysis water manufacture can also be carried out and the same operation effect can be obtained also in this case.

[0027] Claim 3 invention is explained. Claim 3 invention is a method for carrying out claim 2 invention more effectively. That is, when making an anode plate room and a cathode room let water flow according to claim 2 invention and electrolyzing water, the amount of water flow to an anode plate room and a cathode room is little. electrolysis of this small amount -- if the load of the direct current 1500C [/l.] or more is carried out and it is electrolyzed to service water (6) and (10), the Joule's heat generated in case the electrical and electric equipment flows cannot fully emit an electrode or underwater, but the problem on which the temperature of a cell rises will arise Claim 3 invention solves the above-mentioned problem by using for cooling of a cell the water (7) which does not carry out electrolysis processing, and (11).

[0028] Drawing 3 is the cross section showing in a cell the example which carries out claim 3 invention which transformed claim 2 invention using the water electrolyzer in which the anode plate room, the middle room, and the cathode room were established with the above-mentioned meaning. (A), (B), and (C) are the walls of a cell, respectively. this cell -- a diaphragm (1), (2) and a dashboard (13), and (14) -- the order from the left -- a stream -- a way (G), an anode plate room (D), a middle room (F), a cathode room (E), and a stream -- it is divided into the way (H) (3) is an anode plate and (4) is a negative

plate. Although you may stick even if separated from the electrode board (3), a diaphragm (1) and an electrode board (4), and the diaphragm (2), what stuck the electrode of the gestalt which has many holes, and by which the laminating of the non-conducting sheet was carried out to the diaphragm side to the diaphragm is desirable. a stream -- a way (G) is surrounded by the side attachment wall (A) and dashboard (13) of a cell -- having -- **** -- a stream -- the way (H) is surrounded by the side attachment wall (B) and dashboard (14) of a cell The materials of a dashboard (13) and (14) are a metal, synthetic resin, etc.

[0029] The raw water by the side of an anode plate (5) is shunted toward the water (6) which carries out electrolysis processing, and the water (7) which does not carry out electrolysis processing. the water (7) which the water (6) which carries out electrolysis processing lets an anode plate room (D) flow, and does not carry out electrolysis processing -- a stream -- it lets a way (G) flow And the water by which let the anode plate room (D) flow and electrolysis processing was carried out carries out unification mixture with the water (7) which does not carry out electrolysis processing, and turns into predetermined acid electrolysis water (8) of pH 2.0-3.0. On the other hand, the raw water by the side of cathode (9) is shunted toward the water (10) which carries out electrolysis processing, and the water (11) which does not carry out electrolysis processing. the water (11) which the water (10) which carries out electrolysis processing lets a cathode room (E) flow, and does not carry out electrolysis processing -- a stream -- it lets a way (H) flow And the water by which let the cathode room (E) flow and electrolysis processing was carried out carries out unification mixture with the water (11) by which electrolysis processing was carried out and which does not carry out post-electrolysis processing, and turns into predetermined alkaline electrolysis water (12) of pH 10.5-12.0. a stream -- the water which lets a way (G) and (H) flow carries out a cooling operation of a cell They are (6'), (7'), and (10') (11') a bulb for adjusting amount of water, respectively. A middle room (F) is filled up with high-concentration electrolyte solution. Usually, 10% or more of solution of potassium chloride or a sodium chloride may be used, and you may feed from the electrolyte solution tank formed independently using a pump etc.

[0030] the water (namely, strong acid nature electrolysis water or strong-base nature electrolysis water) which carried out electrolysis processing both anode plate and cathode sides in drawing 3 , and a stream -- the mixture with the water which let a way (G) and (H) flow Although unification mixture may be carried out in the place which came out of the cell as shown in drawing 3 , a hole may be prepared near the up outlet of a dashboard (13) and (14), and you may mix through this hole, respectively. There are three kinds of introductory methods to each anode plate room (D) and a cathode room (E). the water (6) which carries out electrolysis processing and (10) -- [moreover,] As shown in drawing 3 , may introduce directly from the entrance established in each lower part of an anode plate room (D) and a cathode room (E), and A hole is prepared in a dashboard (13) and the lower part of (14). first each of raw water (5) and (9) Passage (G), It may introduce into (H) and may introduce into an anode plate room (D) and a cathode room (E) through a hole, respectively, and a hole may be prepared in a dashboard (13) and the upper part of (14), it may be made to replace by the water and gas which carried out electrolysis processing from each of this hole, and you may introduce. the electrolysis in this case of making it replace and making it introduce -- service water (6) and the amount of water flow of (10) are the values of the minimum value which is a value near the capacity of the

gas which occurs in an anode plate, and is calculated by electrolysis by (above-mentioned a) and the above-mentioned (b) formula the same as the case where operation which electrolyzes water using the electrolyzer shown in drawing 3 is performed using the electrolyzer shown in drawing 1 and drawing 2 -- it is Moreover, the same is said of the operation in that case. moreover, this stream -- a way -- preparing -- a stream -- the method which cools a cell using the water which lets a way flow is applicable also to the water electrolysis method using the electrolyzer shown in drawing 1

[0031] Claim 4 invention is explained. deformation of claim 2 invention which shows claim 4 invention to drawing 2 -- it is -- a stream -- it is the method of performing the dashboard for forming a way using the water electrolyzer as which it was made serving with an electrode board Drawing 4 is the cross section showing an example of the water electrolyzer. (A), (B), and (C) are the walls of a cell, respectively. this cell is divided one by one by the anode plate (3), and a diaphragm (1), a diaphragm (2) and a negative plate (4) -- having -- the order from the left -- a stream -- a way (G), an anode plate room (D), a middle room (F), a cathode room (E), and a stream -- the way (H) is formed That is, an anode plate room (D) is formed by the anode plate (3) and the diaphragm (1), and the cathode room (E) is formed by the negative plate (4) and the diaphragm (2). moreover, a stream -- a way (G) is surrounded by the side attachment wall (A) and anode plate (3) of a cell -- having -- **** -- a stream -- the way (H) is surrounded by the side attachment wall (B) and negative plate (4) of a cell

[0032] The raw water by the side of an anode plate (5) is shunted toward the water (6) which carries out electrolysis processing, and the water (7) which does not carry out electrolysis processing. the water (7) which the water (6) which carries out electrolysis processing lets an anode plate room (D) flow, and does not carry out electrolysis processing -- a stream -- it lets a way (G) flow And the water by which let the anode plate room (D) flow and electrolysis processing was carried out carries out unification mixture with the water (7) which does not carry out electrolysis processing, and turns into predetermined acid electrolysis water (8) of pH 2.0-3.0. On the other hand, the raw water by the side of cathode (9) is shunted toward the water (10) which carries out electrolysis processing, and the water (11) which does not carry out electrolysis processing. the water (11) which the water (10) which carries out electrolysis processing lets a cathode room (E) flow, and does not carry out electrolysis processing -- a stream -- it lets a way (H) flow And the water by which let the cathode room (E) flow and electrolysis processing was carried out carries out unification mixture with the water (11) by which electrolysis processing was carried out and which does not carry out post-electrolysis processing, and turns into predetermined alkaline electrolysis water (12) of pH 10.5-12.0. a stream -- the water which lets a way (G) and (H) flow carries out a cooling operation of a cell They are (6'), (7'), and (10') (11') a bulb for adjusting amount of water, respectively.

[0033] the water (namely, strong acid nature electrolysis water or strong-base nature electrolysis water) which carried out electrolysis processing both anode plate and cathode sides in drawing 4 , and a stream -- the mixture with the water which let a way (G) or (H) flow Although unification mixture may be carried out in the place which came out of the cell as shown in drawing 4 , a hole may be prepared near the up outlet of an anode plate (3) and a negative plate (4), and you may mix through this hole, respectively. Moreover, there are three kinds of introductory methods to each anode plate room (D) or cathode room (E) of the water (6) which carries out electrolysis processing, and (10). As shown in

drawing 4 , may introduce directly from the entrance established in each lower part of an anode plate room (D) and a cathode room (E), and the lower part of an anode plate (3) and a negative plate (4) -- a hole -- preparing -- each of raw water (5) and (9) -- first -- a stream -- a way (G) -- It may introduce into (H) and may introduce into an anode plate room (D) or a cathode room (E) through this hole, respectively, and a hole may be prepared in the upper part of an anode plate (3) and a negative plate (4), it may be made to replace by the water and gas which carried out electrolysis processing from each of this hole, and you may introduce. the electrolysis in this case of making it replace and making it introduce -- service water (6) and the amount of water flow of (10) are the values of the minimum value which is a value near the capacity of the gas which occurs in an anode plate, and is calculated by electrolysis by (above-mentioned a) and the above-mentioned (b) formula the same as the case where operation which electrolyzes water using the electrolyzer shown in drawing 4 is performed using the electrolyzer shown in drawing 1 - drawing 3 -- it is Moreover, the same is said of the operation in that case.
[0034] In the example shown in above-mentioned drawing 3 and above-mentioned drawing 4 , you may use it for one side of cathode and an anode plate independently, respectively, and may use it combining invention of claims 2 and 3. For example, it is attaching the equipment of invention of a claim 2 and attaching the equipment of invention of a claim 3 in an anode plate side at a cathode side etc. Moreover, although it has the cell which prepared the middle room (F) divided with the diaphragm of two sheets between the anode plate room (D) and the cathode room (E) in the electrolyzer of drawing 1 - drawing 4 , this invention can be carried out, even if it uses the electrolyzer equipped with the cell which does not prepare one middle room using a diaphragm (1), as shown in drawing 5 and drawing 6 . And when using this equipment, electrolyte solution (15) and (16) are mixed in the water (6) which lets water flow in an anode plate room (D) and a cathode room (E) and which carries out electrolysis processing, and (10). Except the operation which adds this electrolyte solution, it is the same as the case where the electrolyzer of drawing 1 - drawing 4 is used.
[0035] The electrode and diaphragm in the electrolyzer used by this invention are explained. Even if it makes it stick with a diaphragm, it is not necessary to stick an electrode board. When using it, sticking an electrode and a diaphragm, it is desirable to use for an electrode board the board which has many holes, and a reticulated thing. Even if it has a hole in using it, opening an interval without sticking an electrode and a diaphragm namely, it is not necessary to have. The material of an electrode board is the board of copper, lead, nickel, chromium, titanium, a tantalum, gold, platinum, an iron oxide, stainless steel, a carbon fiber, or graphite, and what plated or burned the metal of a platinum group to titanium as a material of an anode plate is desirable. Moreover, as a material of a negative plate, you may use high chromium stainless steel (SUS316L) and nickel.
[0036] moreover, in using it, sticking with a diaphragm the electrode board which has many above-mentioned holes The sheet-like non-conducting material which has the hole of a large number which are mostly in agreement with the hole of an electrode board between each electrode board and a diaphragm, For example, a fluorine system resin (brand-name Teflon), ABS plastics, acrylic resin, An epoxy resin, a polyurethane resin, a polyethylene resin, polypropylene resin, A Nylon, a polyethylene-terephthalate resin, polyamide resin, The electrode board which arranges and carried out the laminating of

the sheets, such as elastomers, such as synthetic resin and natural rubber, such as vinylchloride resin, SBR, a chloroprene, and a polybutadiene, or the electrode board with which the electric insulation coat was made to form in a diaphragm side, and many holes opened is used. This electrode board itself is indicated by JP,8-276184,A. Since this electrode board can decrease the phenomenon which the ion generated in respect of the electrode moves to a counter electrode, and the phenomenon which gas stagnates and checks current between an electrode and a diaphragm in order not to make it electrolyze in respect of the electrode of the side which touches a diaphragm, it is desirable. Drawing 1 , drawing 3 , and drawing 5 are the examples which used the electrode board with which many holes of the above-mentioned structure opened. Moreover, in drawing 4 , in order that an electrode board may make a dashboard serve a double purpose, the electrode board with which many holes are not opened is used.

[0037] Moreover, as a diaphragm, they are textile fabrics and nonwoven fabrics, such as polyvinyl-fluoride system fiber, asbestos, glass wool, polyvinyl chloride fiber, polyvinylidene chloride fiber, a polyester fiber, and an aroma group polyamide fiber, as what has water flow nature, for example. Moreover, it is the diaphragm which used textile fabrics and the nonwoven fabric of a polyester fiber, nylon fiber, and a polyethylene fiber for the aggregate, for example, and mixed titanium oxide to film material at a chlorinated polyethylene, a polyvinyl chloride, a polyvinylidene fluoride, or these. Moreover, semipermeable membrane, such as cellophane, or a cation exchange membrane, an anion exchange membrane, etc. are used as a diaphragm with little water flow nature. the electrolysis conditions of this invention -- electrolysis of a small amount -- since the current of a heavy load is passed, very strong acidity and alkaline water are made to generate or high-concentration chlorine gas makes service water generate, it is desirable to choose the diaphragm of the material which can bear the condition

[0038]

[Example] The example using the water electrolyzer shown in example 1 drawing 3 is explained. The size of a cell was 6cm in 15cm long, 9cm wide, and thickness, used platinum / oxidization iridium baking electrode for the having-hole of a large number whose effective area is 2 50cm as electrode board for anode plates (3) titanium board, and used the electrode which carried out platinum plating for the having-to electrode board for cathode (4)-hole of a large number whose effective area is 2 50cm titanium board. The laminating of the fluororesin (Teflon) sheet which is the non-conducting material which has many holes was carried out, and it was used for the diaphragm side of each electrode board. MF film made of a nonwoven fabric was used for the diaphragm (1) of the batch of an anode plate room and a middle room, the cation-exchange-resin film was used for the diaphragm (2) of the batch of a cathode room and a middle room, and the middle room (F) was filled up with sodium chloride solution of about 30% of concentration as an electrolyte. the dashboard (13) by which the anode plate side of a cell was prepared between the side attachment wall (A) and the anode plate (3) -- an anode plate room (D) and a stream -- it divides into a way (G) -- having -- **** -- electrolysis -- the purpose for which an anode plate room (D) lets service water (6) flow, and the water (7) by which electrolysis processing is not carried out cools a cell -- a stream -- a way (G) lets water flow It joins again, and is mixed in the place which came out of the cell, and both water is discharged from an outlet (8). moreover, the dashboard (14) by which the cathode room side was prepared between the side attachment wall (B) and the negative

plate (4) -- a cathode room (E) and a stream -- it divides into a way (H) -- having -- **** -- electrolysis -- the purpose for which a cathode room lets service water (10) flow, in addition service water (11) cools a cell -- a stream -- a way (H) lets water flow, and it joins again, mixes, and is discharged from a

[0039] The direct current which carries out a load to an electrode board is 9.0A, and voltage was made into 6 or 7v. the electrolysis duty of water (6) which lets water flow in an anode plate room -- a part for 0.1l./-- setting up -- moreover, a stream -- the amount of water of the water (7) which lets water flow on a way (G) was set as a part for 1.25l./, unification mixture was carried out in the neighborhood which came out of the cell, and the 1.35l. acid electrolysis water for /was obtained The pH value of the obtained acid electrolysis water was 2.68, the ORP value was 1130mV, and the measured value of the free chlorine to contain was 90 ppm. the electrolysis duty of water (10) which lets water flow in a cathode room on the other hand -- a part for 0.1l./-- setting up -- a stream -- the amount of water of the water (11) which lets water flow on a way (H) was set as a part for 0.9l./, unification mixture was carried out in the neighborhood which came out of the cell, and alkaline water was obtained The pH value of the obtained alkaline electrolysis water was 11.54. The current burden of this example electrolysis service water (6) Hits, and is equivalent to 9.0A (5400C/(l.)). Although continuously experimented on these conditions for 48 hours, no scale buildup over cathode was generated. Moreover, the **** phenomenon which water moves to cathode from an anode plate was not seen at all. next, the amount of water which lets an anode plate room flow where the pH value of the acid electrolysis water to generate is kept constant and a stream -- various amount of water which lets a way (G) flow was changed, change of a real trial, ORP, and a free-chlorine content was measured, and the **** phenomenon was observed The result is shown in Table 1. It turns out that a **** phenomenon arises [reduction and the current burden of free-chlorine concentration] in l. in 1350 and 338C /with the increase in the electrolysis duty of water of an anode plate, and the water level of a middle room goes up.

[0040]

[Table 1]

[0041] the same [using the same electrolyzer as an example 1] except having used the electrode board which replaced with a titanium board and platinum / oxidization iridium baking electrode, and gave platinum plating to titanium as an electrode board for example 2 anode plates (3) -- it was operated When the generating effect of the free chlorine at this time was investigated, the result of Table 2 was obtained. High-concentration chlorine generating can be checked from Table 2.

[0042]

[Table 2]

[0043]

[Effect of the Invention] the little electrolysis extracted from raw water in this invention, since an electrolyte is made to exist in service water, the load of the direct current 1500C [/l.] or more is carried out, and water electrolysis is carried out, and it mixes with raw water after that and considers as the electrolysis water of the target pH Generation ion concentration can be raised at the time of electrolysis, and the transfusion phenomenon of water can be prevented, and the generation effect of a free chlorine can be heightened. That the free-chlorine concentration which (2) acid electrolysis water with much [(1)

electrolysis efficiency is bad and] power consumption in it contains cannot become high easily and adjustment of concentration [which is not easy] (3) Will start salt damage, if it is mostly used for the cause and agricultural products of rust for a long period of time, the electrolyte, i.e., the salinity, contained in acid electrolysis water or alkaline electrolysis water. (4) The fault of the conventional water electrolysis of being easy to generate the trouble in which a scale adheres to cathode by electrolysis can be improved, and the acid electrolysis water of predetermined pHpH 2.0-3.0 and the alkaline electrolysis water of pH 10.5-12.0 can be manufactured efficiently. Moreover, since a scale buildup can be prevented, operation of washing from reversal of the periodical pole of an electrode currently performed conventionally and an acid becomes unnecessary, and the softener of the raw water which carries out electrolysis processing also has the advantage which becomes unnecessary. Moreover, in this invention, a middle room is prepared, and when the electrolyzer which filled up this middle room with the electrolyte is used, electrolytic supply becomes easy.

TECHNICAL FIELD

[The technical field to which invention belongs] this invention electrolyzes water and relates to the method of manufacturing acid electrolysis water and alkaline electrolysis water.

PRIOR ART

[Description of the Prior Art] Electrolyzing the water which added the chlorine-based electrolyte of a small amount, and making acid electrolysis water and alkaline electrolysis water generate is performed conventionally. Conventional acid electrolysis water has hydrogen ion concentration (pH) in the range of 2.0-3.5 (generally 2.4-2.7), and oxidation reduction potential (ORP) shows more than 1100V, and contains a free chlorine 10 ppm or more. Thus, since acid electrolysis water contains a free chlorine and presents strong acid and high oxidation reduction potential, it has the powerful sterilization effect to Escherichia coli, various kinds of bacteria, or bacteria, and is beginning to be widely used in a medical field, an agricultural field, a dairy field, etc. in recent years. moreover, since the ranges of pH are 10.5-12.0 and it presents strong alkalinity, having sterilizing properties too and having a strong detergency to the dirt which contains an oil content and protein simultaneously knows alkaline electrolysis water -- having -- **** -- washing of vegetables, fruit, a stock raising article, or a fishery article, and washing of a machine part or electronic material -- a use new as service water is coming out

[0003] For manufacturing these acid electrolysis water and alkaline electrolysis water by the electrolysis of water The water electrolysis equipment of the structure divided into the anode plate room and the cathode room by the diaphragm is used. The method of letting flow and electrolyzing into an anode plate room and a cathode room the raw water which added the electrolyte beforehand, A high concentration electrolysis room is filled up with the diaphragm of two sheets into a middle room using the water electrolysis equipment of the structure divided into the anode plate room, the middle room, and the cathode room, and the method of letting flow and electrolyzing raw water into an anode plate room and a cathode room etc. is adopted.

[0004] Even if it carries out a deer, it makes it acid electrolysis water and it makes it alkaline electrolysis water, the property and composition which are demanded greatly change with the purpose which uses it, or uses. For example, although the free-chlorine concentration which influences the sterilization force of water is the most important when using acid electrolysis water for medical-application ways, such as disinfection of an endoscope, even if the electrolyte concentration to contain is high, it is not a problem so much. On the other hand, when using acid electrolysis water for an agricultural use, the salinity concentration to contain must be low. Moreover, it will become a problem if an odor is too strong when using it for the sterilization and gargling in a mouth with dentistry etc. Moreover, depending on the kind of metal currently used in the case of sterilization or washing, generating of rust poses a problem. Thus, although the demand of the user to acid electrolysis water and alkaline electrolysis water was various, in order to correspond to those demands, the fundamental design specification of electrolysis equipment needed to be changed former each time.

[0005] Moreover, conventional water is electrolyzed and there is a trouble of many ** in the manufacture method of acid electrolysis water or alkaline electrolysis water. That is, (1) electrolysis efficiency is bad and there is much power consumption. (2) The free-chlorine concentration which acid electrolysis water contains cannot become high easily, and adjustment of concentration is not easy. (3) Salt damage will be started if it is mostly used for the cause and agricultural products of rust for a long period of time, the electrolyte, i.e., the salinity, contained in acid electrolysis water or alkaline electrolysis water. (4) It is easy to generate the trouble in which a scale adheres to cathode by electrolysis.

[0006] Although some causes with much [the electrolysis efficiency of (1) is bad and] power consumption in it are considered in the conventional manufacture method Since one is electrolyzed into water where a little electrolyte is added, the conductivity of solution is low, Only the ion in which electrolysis exists near an anode plate or the cathode two bypasses the solution of most which delivers an electron on an electrode front face and is supplied to an electrolyzer, without contributing to electrolysis, and it is discharged, A part of hydrogen ion which a part of ion electrolyzed into 3 ** passed the diaphragm, and it moved to the counter electrode side, namely, was generated by the anode plate moves to cathode, and the hydroxide ion generated by cathode moves to an anode plate, When the ion concentration of an anolyte is low to four, it is that the **** phenomenon of water happens from an anode plate toward cathode etc. As for the amount of theoretical current calculated as a result, for example, Faraday's law required for pH value to generate the acid electrolysis water of 2.7, it is general to require l. in 600 or 1000C /in fact to being 192C/l.

[0007] Moreover, it is thought that a electrolysis reaction [in / an anode plate / in the above-mentioned cause of (2)] has low generation of the following chloric-acid ion which follows generation and it of chlorine gas since the electrolyte concentration to add is low, although the reaction of the chloride ion contained in water and an electrolyte competes, and acid electrolysis underwater free-chlorine concentration does not become high. Therefore, although oxides which have the catalyst effect as an electrode material for anode plates, such as iridium and palladium, are used to raise the generating efficiency of a free chlorine as a cure conventionally, it is very expensive and it is difficult to adjust free-chlorine concentration freely. Moreover, although the

concentration of a free chlorine can be raised to some extent if the amount of the electrolyte to add is increased, generation underwater salinity concentration is made increased increasingly, and the problem of the above-mentioned **** (3) arises. although there is nothing with generation underwater salinity concentration low originally that it was alike and was exceeded, in the conventional generation method, it is 1200 ppm in 600 or salinity concentration

[0008] Furthermore, the above-mentioned problem of (4) is that the components for magnesium, such as calcium, etc. contained in water by electrolysis adhere to a negative plate as a scale, and the electric resistance of an electrode increases by the scale buildup, a diaphragm carries out blinding, or it serves as a serious trouble of the flow of water being checked. Complicated means -- the cure against a scale changes the polarity of cathode and an anode plate in the middle of electrolysis, or dissolves it by the acidic solution -- were taken conventionally.

EFFECT OF THE INVENTION

[Effect of the Invention] the little electrolysis extracted from raw water in this invention -- since an electrolyte is made to exist in service water, the load of the direct current 1500C [/l.] or more is carried out, and water electrolysis is carried out, and it mixes with raw water after that and considers as the electrolysis water of the target pH Generation ion concentration can be raised at the time of electrolysis, and the **** phenomenon of water can be prevented, and the generation effect of a free chlorine can be heightened. That the free-chlorine concentration which (2) acid electrolysis water with much [(1) electrolysis efficiency is bad and] power consumption in it contains cannot become high easily and adjustment of concentration [which is not easy] (3) Will start salt damage, if it is mostly used for the cause and agricultural products of rust for a long period of time, the electrolyte, i.e., the salinity, contained in acid electrolysis water or alkaline electrolysis water. (4) The fault of the conventional water electrolysis of being easy to generate the trouble in which a scale adheres to cathode by electrolysis can be improved, and the acid electrolysis water of predetermined pHpH 2.0-3.0 and the alkaline electrolysis water of pH 10.5-12.0 can be manufactured efficiently. Moreover, since a scale buildup can be prevented, operation of washing from reversal of the periodical pole of an electrode currently performed conventionally and an acid becomes unnecessary, and the softener of the raw water which carries out electrolysis processing also has the advantage which becomes unnecessary. Moreover, in this invention, a middle room is prepared, and when the electrolysis equipment which filled up this middle room with the electrolyte is used, electrolytic supply becomes easy.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] By having been made in view of the above-mentioned situation, and devising the water flow method of water, the addition method of electrolyte solution, and the load of a direct current in electrolyzing water and manufacturing acid electrolysis water and alkaline electrolysis water, this invention has little power consumption, is excellent in the generating efficiency of a free chlorine, and aims at offering the method that the scale buildup to cathode can be prevented.

MEANS

[Means for Solving the Problem] The free-chlorine concentration which (2) acid electrolysis water with much [(1) electrolysis efficiency which is the conventional trouble is bad, and] power consumption in it contains for this invention person to make the above-mentioned purpose attain as a result of advancing research could not become high easily, and it predicted that it has a problem in the method of electrolysis that all there is it, much the electrolyte, i.e., the salinity, contained in (3) acid electrolysis water and the alkaline electrolysis water adjustment of concentration is not easy water, etc. And although raw water is let flow and electrolyzed into the whole-quantity cell by the conventional method in order that the acid electrolysis water which pH shows the range of 2.0 to 3.5, and pH may obtain the alkaline electrolysis water in which 10.5 to 12.0 is shown as a result of studying the solution method That delivered and received the electrode and the electron in practice by this method, and the electrolysis reaction has contributed It is bypassed and discharged only with the inner small kana water, without remaining most contributing to electrolysis, the electrolysis which introduces most electrolytes added into a cell with it there paying attention to being discharged without contributing to electrolysis similarly -- by restricting amount of water a little, making an electrolyte exist in this, and electrolyzing by the heavy load By that the above-mentioned problem is solvable and adoption of this means, the knowledge of the ability to also cancel the trouble of a scale buildup over the cathode of (4) was carried out, and this invention was completed.

[0011] Namely, this invention is equipped with the cell which prepared the anode plate room which has arranged the anode plate, and the cathode room which has arranged the negative plate. And make it shunt the raw water supplied to an anode plate side toward the water which carries out electrolysis processing, and the water which does not carry out electrolysis processing. Make an anode plate room let flow the water which carries out electrolysis processing, and the water discharged from the anode plate room is made into the structure made to join the above-mentioned water which does not carry out electrolysis processing. Moreover, make it shunt the raw water supplied to a cathode side toward the water which carries out electrolysis processing, and the water which does not carry out electrolysis processing. Make a cathode room let flow the water which carries out electrolysis processing, and water is electrolyzed using the water electrolyzer which made the water discharged from the cathode room the structure made to join the above-mentioned water which does not carry out electrolysis processing. It is the method of manufacturing the acid electrolysis water of pH 2.0-3.0, and the alkaline electrolysis water of pH 10.5-12.0. an electrolyte is existed in the water which carries out electrolysis processing -- making -- an anode plate and a negative plate -- electrolysis processing -- it is the electrolysis water manufacturing method characterized by carrying out the load of the direct current 1500C [per 1l. of service water] or more

[0012] In short, this invention differs from the conventional method which lets flow and electrolyzes the whole quantity of raw water into an anode plate room and a cathode room. Let a part of raw water flow in an anode plate room and a cathode room, and high-concentration strong acid nature electrolysis water and strong-base nature electrolysis water are made to generate by making remarkably abundant conventionally the amount of

direct currents per electrolysis duty of water, and electrolyzing it. It is the method of obtaining the acid electrolysis water (pH 2.0-3.0) and alkaline electrolysis water (pH 10.5-12.0) of the concentration which is mixed with raw water, dilutes this high-concentration strong acid nature electrolysis water and strong-base nature electrolysis water after that, and is made into the purpose.

[0013]

[Embodiments of the Invention] this invention method is the electrolyzer equipped with the cell which prepared the anode plate room which has arranged the anode plate, and the cathode room which has arranged the negative plate. And make it shunt the raw water supplied to an anode plate side toward the water which carries out electrolysis processing, and the water which does not carry out electrolysis processing. Make an anode plate room let flow the water which carries out electrolysis processing, and the water discharged from the anode plate room is made into the structure made to join the above-mentioned water which does not carry out electrolysis processing. Moreover, make it shunt toward the water which carries out electrolysis processing of the raw water supplied to a cathode side, and the water which does not carry out electrolysis processing, a cathode room is made to let flow the water which carries out electrolysis processing, and the water discharged from the cathode room is performed using the water electrolyzer made into the structure made to join the above-mentioned water which does not carry out electrolysis processing. Drawing 1 - drawing 4 are what illustrated the water electrolyzer of this structure, and are a cross section, respectively.

[0014] Drawing 1 is the cross section of the water electrolyzer equipped with the cell which prepared the anode plate room, the middle room, and the cathode room by dividing with the diaphragm of two sheets. It is the example which carries out claim 2 invention. (A), (B), and (C) are the walls of a cell, respectively. This cell is divided into the anode plate room (D), the middle room (F), and the cathode room (E) by a diaphragm (1) and (2). (3) And (4) is an electrode board, an electrode board (3) is an anode plate and an electrode board (4) is cathode. Many holes have opened to each electrode board. Although you may stick even if separated from the electrode board (3), a diaphragm (1) and an electrode board (4), and the diaphragm (2), when showing and sticking the case where it has stuck, as for drawing 1 , it is desirable to insert the non-electrical conducting material of the shape of a sheet in which the same hole opened with each electrode board between each electrode board and each diaphragm. the raw water by the side of an anode plate (5) is shunted toward the water (6) which carries out electrolysis processing, and the water (7) which does not carry out electrolysis processing (the water which carries out electrolysis processing hereafter -- electrolysis -- it may be called service water) The water (6) which carries out electrolysis processing lets an anode plate room (D) flow, joins the water (7) by which electrolysis processing was carried out and which does not carry out post-electrolysis processing, is diluted, and turns into predetermined acid electrolysis water (8) of pH 2.0-3.0. On the other hand, the raw water by the side of cathode (9) is shunted toward the water (10) which carries out electrolysis processing, and the water (11) which does not carry out electrolysis processing. The water (10) which carries out electrolysis processing lets a cathode room (E) flow, joins the water (11) by which electrolysis processing was carried out and which does not carry out post-electrolysis processing, is diluted, and turns into predetermined alkaline electrolysis water (12) of pH 10.5-12.0.

[0015] (6') And (10') (11') it is a bulb for adjusting amount of water, respectively (7'). A middle room (F) is filled up with high-concentration electrolyte solution. Usually, 10% or more of solution of potassium chloride or a sodium chloride may be used, and you may feed from the electrolyte solution tank formed independently using a pump etc. Electrolyte concentration may be high how much, unless the fluidity of solution is barred. moreover, the electrolysis in the case of this example -- although the water flow method of of service water (6) and (10) may be introduced from the lower entrance of an anode plate room and a cathode room and may take out the generation water and gas after electrolysis from an up outlet, from the hole for upside outlets, it may be made to replace by the generation water after electrolysis, and gas, and may be introduced the electrolysis in this case of making it replace and making it introduce -- the amount of water flow of service water is a value near the capacity of the gas which occurs in an anode plate and cathode, and serves as the minimum value calculated by (a) and the (b) formula which are mentioned later

[0016] the electrolysis which lets water flow in the anode plate room (D) and cathode room (E) for electrolysis -- the electrolysis duty of water of service water (6) and (10) is an amount shown by (a) and the (b) formula which are mentioned later, in the case of the current load of 1A (ampere), the peak is a part for 40ml/, and the value turns into a value counted backward from l. in 1500C / If it electrolyzes the above condition, in an anode plate side, anions, such as a chloride ion contained in the electrolyte solution with which it was filled up in the middle room (F), will move by electrophoresis into an anode plate room (D) based on the transference number of each ion, an anion and water will be electrolyzed in an electrode front face, and gas, such as 1.9 or less strong acid nature electrolysis water and oxygen, and chlorine, will generate [pH value]. This strong acid nature electrolysis water is discharged from an anode plate room (D), the water (7) by which electrolysis processing is not carried out is joined, and the acid electrolysis water (8) which has the target pH value (pH 2.0-3.0) is generated. On the other hand, in a cathode side, cations, such as sodium ion contained in the electrolyte solution with which it was filled up in the middle room (F), move to the cathode interior of a room based on the transference number of each ion, a cation and water are electrolyzed in an electrode front face, and gas, such as 12.1 or more strong-base nature electrolysis water and hydrogen, generates [pH value]. This strong-base nature electrolysis water is discharged from a cathode room (E), the water (11) by which electrolysis processing is not carried out is joined, and the alkaline electrolysis water (12) which has the target pH value (pH 10.5-12.0) is generated.

[0017] In this invention, the load of the direct current 1500C [/l.] or more is carried out to the electrolysis duty of water. If this load is counted backward, the maximum of the electrolysis duty of water in the case of the current value of 1A will become 40ml. The reason for carrying out the load of the direct current 1500C [/l.] or more is from that it was the value of 1500C/l. or more, that the phenomenon in which the generation efficiency of a free chlorine increased by l. in 1500C /or more was shown, and a scale buildup [in / cathode / in 1500C /or more] not having been seen by l., as a result of investigating a current burden required to prevent the transfusion phenomenon of the water which is one of the causes to which electrolysis efficiency is reduced. And as mentioned above, the pH value of the strong acid nature electrolysis water generated in the anode plate interior of a room's at the time of a 1500C [/l.] or more current load

becomes 1.9 or less, and 12.1 or more are the pH value of the strong-base nature electrolysis water of the cathode interior of a room.

[0018] And the minimum value of this electrolysis duty of water is the amount which is sufficient for replacing the gas generated in an anode plate and cathode at the time of electrolysis, i.e., the amount approximated to the amount of gas generation calculable [with Faraday's law]. Incidentally it is current of 1A (ampere) calculated by Faraday's law, and the yield of the gas in the anode plate in reference condition is a part for 3.49ml/, and the yield of the gas in cathode is a part for 6.98ml/. If the above conditions are summarized as a simple formula, the range the minimum [of the electrolysis duty of water] - greatest will become the formula of the following (a) and (b).

Anode plate side electrolysis duty-of-water (part for milliliter/) =3.5xA-40xA ... (a)

Cathode side electrolysis duty-of-water (part for milliliter/) =7.0xA-40xA ... (b)

(However, A is the amount of electrolysis current)

The strong acid nature electrolysis water and strong-base nature electrolysis water which were described above by carrying out water electrolysis processing within the limits of this can be made to generate. And the target acid electrolysis water and target alkaline electrolysis water of pH value can be obtained by mixing this generated strong acid nature electrolysis water and strong-base nature electrolysis water with the water by which electrolysis processing is not carried out.

[0019] next, electrolysis -- pH-value control can be performed easily, the free-chlorine concentration contained in acid electrolysis underwater is raised, and by mixing with the water which carries out the load of the direct current 1500C [/l.] or more to service water, and does not carry out electrolysis processing after that, and diluting explains the reason which a power efficiency can improve first, a mixing ratio with the water in which the reason which pH value can adjust easily does not carry out electrolysis processing -- it is because a change of a rate can be made freely, without changing electrolysis conditions That is, specifically, the desired acid electrolysis water and desired alkaline electrolysis water of pH value can be easily obtained by adjusting a bulb (10') and (11') by the cathode side again by adjusting a bulb (6') and (7') about an anode plate side in drawing 1 .

[0020] Next, why the free-chlorine concentration contained in acid electrolysis underwater is raised is explained. The anode plate side electrolysis duty of water in this invention is an amount (a part for milliliter/) which multiplied current (ampere) by 40 at the maximum. If this counts backward, the current which carries out a load to the water per l./m will be 25A or more, and the current burden of electrolysis will be a very high value compared with the conventional conditions. Consequently, the chloride-ion concentration of the anode plate interior of a room serves as a high value compared with the conventional method.

[0021] It is as follows when the typical electrode reaction formula which happens on an anode plate front face is shown here.

$2H_2O-4e^- \rightarrow O_2+4H^+$ ..... (c)

$2Cl(s)^- -2e^- \rightarrow Cl_2$ ..... (d)

If the reaction of (c) is decomposed and considered here, water will dissociate to a hydrogen ion and a hydroxide ion first, and it will be thought that it passes through process in which an electron is taken by electrode reaction and a hydroxide ion turns into oxygen gas and a hydrogen ion.

4H2O <=> 4H++4OH~ ..... (e)
4OH~-4e~-> O2+2H2O ..... (f)
Therefore, the reaction of (c) and (d) competes in an electrode front face, and the concentration of OH~ion which exists near the electrode front face as a factor, and Cl~ion which governs a reaction rate involves greatly. So, when the chloride-ion concentration of the anode plate interior of a room is high like this invention, chlorine gas can be generated by the ratio higher than the conventional method.
[0022] Moreover, the chlorine gas which occurred reacts with water further, and generates a strong hypochlorous acid, a strong hypochlorite, etc. of sterilizing properties.
Cl2+H2O <=> HCl+HClO .... (g)
HClO <=> H++ClO~ ..... (h)
the method of this invention not only being easily raised in free-chlorine concentration but electrolysis -- free-chlorine concentration can be easily adjusted by changing a ratio with the water (7) in which the amount of service water (6) does not carry out change and electrolysis processing namely, electrolysis -- the time of making the amount of service water (6) into the minimum value of the (a) formula -- free-chlorine concentration -- most -- high -- becoming -- electrolysis -- the amount of service water (6) is increased -- it is alike, and it can follow and free-chlorine concentration can be made low Moreover, although the electrode material for anode plates may use an expensive platiniridium, expensive palladium, etc. which are generally used in case the acid electrolysis water of high free-chlorine concentration is manufactured, if it is the conditions which raise the free-chlorine concentration of this invention, the electrode material which carried out platinum plating can also obtain high free-chlorine concentration to titanium.
[0023] Next, the reason which a power efficiency can improve is explained. like the above-mentioned -- this invention -- the electrolysis duty of water -- receiving -- a current burden -- high -- an anode plate room and a cathode room -- setting -- electrolysis -- service water -- since inner ion concentration and inner electric electric conductivity are high, the voltage at the time of electrolysis can be lowered, consequently power consumption can be made low Moreover, since underwater ion concentration increases, the transfusion phenomenon which a moisture child moves toward cathode from an anode plate can be suppressed.
[0024] Next, the reason for decreasing the scale-buildup phenomenon over cathode is explained. The main electrolysis reactions performed in cathode are as follows.
2H2O+2e~-> H2+2OH~ ..... (i)
Na++e~-> Na ..... (j)
2Na+2H2O -> 2Na++2OH~+H2 .. (k)
Like the above-mentioned reaction formula, by cathode, metal ions, such as sodium, are returned with generating of a hydroxide ion and hydrogen gas, it once becomes a metal, and water and the phenomenon of reacting happen further. If ion, such as calcium, magnesium, and a silica, exists underwater at this time, it is returned at a reaction with the same said of those ion, and in order that it may be metalized or components, such as calcium and magnesium, may generate a hydroxide, these will often carry out deposition to an electrode front face as a scale.
[0025] Thus, the phenomenon in which a scale adheres to cathode from the former in the case of the electrolysis of water is considered as an unescapable thing, the hardness component contained in raw water, using a water softener etc. as a cure against

antisticking is removed, or the becoming measures from which the scale adhering to the electrode is washed from an acid and which it becomes [measures], reverse the polarity of an electrode and make a scale exfoliate are taken. the electrolysis which lets water flow in the cathode room in the case of generating alkaline electrolysis water by electrolysis by the conventional method -- although the amount of current which carries out a load to service water so much is about (720C/(l.)) 12A per l./m about, often depositing on the surface of a negative plate in the case of this condition, and becoming a scale is observed Visual observation of the electrode front face of electrolysis is carried out using the cell which made the side attachment wall of a cathode room with a transparent material using the electrode given in a JP,8-276184,A official report mentioned later. As a result of studying the conditions which do not deposit a scale in cathode, the amount of water flow is received. 1500C/l. or more When the load of the current 1800C [/l.] or more was carried out preferably and pH of a cathode room was made into 12.1 or more strong-base nature, it checked that a scale did not deposit on an electrode front face. It is surmised that this reason is because many scale components are dissolved or it is hard to deposit a crystal under strong-base conditions. Furthermore, compared with the diaphragm by the side of an anode plate, the direction of the ion permeability of the diaphragm by the side of cathode chooses a large thing, and keeping acid the pH value of the solution of the middle interior of a room also has the effect which prevents generating of a scale.

[0026] Drawing 2 is the cross section of the cell which transformed drawing 1 . Although the cell of drawing 1 is a cell made to stick each electrode board (3) and (4) to each diaphragm (1) and (2) using the electrode board with which many holes opened as the electrode board (3) of an anode plate, and an electrode board (4) of cathode The usual electrode board with which the hole has not opened as the electrode board (3) of an anode plate as shown in drawing 2 , and an electrode board (4) of cathode is used. Water is electrolyzed using the cell which has arranged each electrode board (3) and (4) in the position distant from each diaphragm (1) and (2), electrolysis water manufacture can also be carried out and the same operation effect can be obtained also in this case.

[0027] Claim 3 invention is explained. Claim 3 invention is a method for carrying out claim 2 invention more effectively. That is, when making an anode plate room and a cathode room let water flow according to claim 2 invention and electrolyzing water, the amount of water flow to an anode plate room and a cathode room is little. electrolysis of this small amount -- if the load of the direct current 1500C [/l.] or more is carried out and it is electrolyzed to service water (6) and (10), the Joule's heat generated in case the electrical and electric equipment flows cannot fully emit an electrode or underwater, but the problem on which the temperature of a cell rises will arise Claim 3 invention solves the above-mentioned problem by using for cooling of a cell the water (7) which does not carry out electrolysis processing, and (11).

[0028] Drawing 3 is the cross section showing in a cell the example which carries out claim 3 invention which transformed claim 2 invention using the water electrolyzer in which the anode plate room, the middle room, and the cathode room were established with the above-mentioned meaning. (A), (B), and (C) are the walls of a cell, respectively. this cell -- a diaphragm (1), (2) and a dashboard (13), and (14) -- the order from the left -- a stream -- a way (G), an anode plate room (D), a middle room (F), a cathode room (E), and a stream -- it is divided into the way (H) (3) is an anode plate and (4) is a negative

plate. Although you may stick even if separated from the electrode board (3), a diaphragm (1) and an electrode board (4), and the diaphragm (2), what stuck the electrode of the gestalt which has many holes, and by which the laminating of the non-conducting sheet was carried out to the diaphragm side to the diaphragm is desirable. a stream -- a way (G) is surrounded by the side attachment wall (A) and dashboard (13) of a cell -- having -- **** -- a stream -- the way (H) is surrounded by the side attachment wall (B) and dashboard (14) of a cell The materials of a dashboard (13) and (14) are a metal, synthetic resin, etc.

[0029] The raw water by the side of an anode plate (5) is shunted toward the water (6) which carries out electrolysis processing, and the water (7) which does not carry out electrolysis processing. the water (7) which the water (6) which carries out electrolysis processing lets an anode plate room (D) flow, and does not carry out electrolysis processing -- a stream -- it lets a way (G) flow And the water by which let the anode plate room (D) flow and electrolysis processing was carried out carries out unification mixture with the water (7) which does not carry out electrolysis processing, and turns into predetermined acid electrolysis water (8) of pH 2.0-3.0. On the other hand, the raw water by the side of cathode (9) is shunted toward the water (10) which carries out electrolysis processing, and the water (11) which does not carry out electrolysis processing. the water (11) which the water (10) which carries out electrolysis processing lets a cathode room (E) flow, and does not carry out electrolysis processing -- a stream -- it lets a way (H) flow And the water by which let the cathode room (E) flow and electrolysis processing was carried out carries out unification mixture with the water (11) by which electrolysis processing was carried out and which does not carry out post-electrolysis processing, and turns into predetermined alkaline electrolysis water (12) of pH 10.5-12.0. a stream -- the water which lets a way (G) and (H) flow carries out a cooling operation of a cell They are (6'), (7'), and (10') (11') a bulb for adjusting amount of water, respectively. A middle room (F) is filled up with high-concentration electrolyte solution. Usually, 10% or more of solution of potassium chloride or a sodium chloride may be used, and you may feed from the electrolyte solution tank formed independently using a pump etc.

[0030] the water (namely, strong acid nature electrolysis water or strong-base nature electrolysis water) which carried out electrolysis processing both anode plate and cathode sides in drawing 3 , and a stream -- the mixture with the water which let a way (G) and (H) flow Although unification mixture may be carried out in the place which came out of the cell as shown in drawing 3 , a hole may be prepared near the up outlet of a dashboard (13) and (14), and you may mix through this hole, respectively. There are three kinds of introductory methods to each anode plate room (D) and a cathode room (E). the water (6) which carries out electrolysis processing and (10) -- [moreover,] As shown in drawing 3 , may introduce directly from the entrance established in each lower part of an anode plate room (D) and a cathode room (E), and A hole is prepared in a dashboard (13) and the lower part of (14). first each of raw water (5) and (9) Passage (G), It may introduce into (H) and may introduce into an anode plate room (D) and a cathode room (E) through a hole, respectively, and a hole may be prepared in a dashboard (13) and the upper part of (14), it may be made to replace by the water and gas which carried out electrolysis processing from each of this hole, and you may introduce. the electrolysis in this case of making it replace and making it introduce -- service water (6) and the amount of water flow of (10) are the values of the minimum value which is a value near the capacity of the

gas which occurs in an anode plate, and is calculated by electrolysis by (above-mentioned a) and the above-mentioned (b) formula the same as the case where operation which electrolyzes water using the electrolyzer shown in drawing 3 is performed using the electrolyzer shown in drawing 1 and drawing 2 -- it is Moreover, the same is said of the operation in that case. moreover, this stream -- a way -- preparing -- a stream -- the method which cools a cell using the water which lets a way flow is applicable also to the water electrolysis method using the electrolyzer shown in drawing 1

[0031] Claim 4 invention is explained. deformation of claim 2 invention which shows claim 4 invention to drawing 2 -- it is -- a stream -- it is the method of performing the dashboard for forming a way using the water electrolyzer as which it was made serving with an electrode board Drawing 4 is the cross section showing an example of the water electrolyzer. (A), (B), and (C) are the walls of a cell, respectively. this cell is divided one by one by the anode plate (3), and a diaphragm (1), a diaphragm (2) and a negative plate (4) -- having -- the order from the left -- a stream -- a way (G), an anode plate room (D), a middle room (F), a cathode room (E), and a stream -- the way (H) is formed That is, an anode plate room (D) is formed by the anode plate (3) and the diaphragm (1), and the cathode room (E) is formed by the negative plate (4) and the diaphragm (2). moreover, a stream -- a way (G) is surrounded by the side attachment wall (A) and anode plate (3) of a cell -- having -- **** -- a stream -- the way (H) is surrounded by the side attachment wall (B) and negative plate (4) of a cell

[0032] The raw water by the side of an anode plate (5) is shunted toward the water (6) which carries out electrolysis processing, and the water (7) which does not carry out electrolysis processing. the water (7) which the water (6) which carries out electrolysis processing lets an anode plate room (D) flow, and does not carry out electrolysis processing -- a stream -- it lets a way (G) flow And the water by which let the anode plate room (D) flow and electrolysis processing was carried out carries out unification mixture with the water (7) which does not carry out electrolysis processing, and turns into predetermined acid electrolysis water (8) of pH 2.0-3.0. On the other hand, the raw water by the side of cathode (9) is shunted toward the water (10) which carries out electrolysis processing, and the water (11) which does not carry out electrolysis processing. the water (11) which the water (10) which carries out electrolysis processing lets a cathode room (E) flow, and does not carry out electrolysis processing -- a stream -- it lets a way (H) flow And the water by which let the cathode room (E) flow and electrolysis processing was carried out carries out unification mixture with the water (11) by which electrolysis processing was carried out and which does not carry out post-electrolysis processing, and turns into predetermined alkaline electrolysis water (12) of pH 10.5-12.0. a stream -- the water which lets a way (G) and (H) flow carries out a cooling operation of a cell They are (6'), (7'), and (10') (11') a bulb for adjusting amount of water, respectively.

[0033] the water (namely, strong acid nature electrolysis water or strong-base nature electrolysis water) which carried out electrolysis processing both anode plate and cathode sides in drawing 4 , and a stream -- the mixture with the water which let a way (G) or (H) flow Although unification mixture may be carried out in the place which came out of the cell as shown in drawing 4 , a hole may be prepared near the up outlet of an anode plate (3) and a negative plate (4), and you may mix through this hole, respectively. Moreover, there are three kinds of introductory methods to each anode plate room (D) or cathode room (E) of the water (6) which carries out electrolysis processing, and (10). As shown in

drawing 4 , may introduce directly from the entrance established in each lower part of an anode plate room (D) and a cathode room (E), and the lower part of an anode plate (3) and a negative plate (4) -- a hole -- preparing -- each of raw water (5) and (9) -- first -- a stream -- a way (G) -- It may introduce into (H) and may introduce into an anode plate room (D) or a cathode room (E) through this hole, respectively, and a hole may be prepared in the upper part of an anode plate (3) and a negative plate (4), it may be made to replace by the water and gas which carried out electrolysis processing from each of this hole, and you may introduce. the electrolysis in this case of making it replace and making it introduce -- service water (6) and the amount of water flow of (10) are the values of the minimum value which is a value near the capacity of the gas which occurs in an anode plate, and is calculated by electrolysis by (above-mentioned a) and the above-mentioned (b) formula the same as the case where operation which electrolyzes water using the electrolyzer shown in drawing 4 is performed using the electrolyzer shown in drawing 1 - drawing 3 -- it is Moreover, the same is said of the operation in that case.
[0034] In the example shown in above-mentioned drawing 3 and above-mentioned drawing 4 , you may use it for one side of cathode and an anode plate independently, respectively, and may use it combining invention of claims 2 and 3. For example, it is attaching the equipment of invention of a claim 2 and attaching the equipment of invention of a claim 3 in an anode plate side at a cathode side etc. Moreover, although it has the cell which prepared the middle room (F) divided with the diaphragm of two sheets between the anode plate room (D) and the cathode room (E) in the electrolyzer of drawing 1 - drawing 4 , this invention can be carried out, even if it uses the electrolyzer equipped with the cell which does not prepare one middle room using a diaphragm (1), as shown in drawing 5 and drawing 6 . And when using this equipment, electrolyte solution (15) and (16) are mixed in the water (6) which lets water flow in an anode plate room (D) and a cathode room (E) and which carries out electrolysis processing, and (10). Except the operation which adds this electrolyte solution, it is the same as the case where the electrolyzer of drawing 1 - drawing 4 is used.
[0035] The electrode and diaphragm in the electrolyzer used by this invention are explained. Even if it makes it stick with a diaphragm, it is not necessary to stick an electrode board. When using it, sticking an electrode and a diaphragm, it is desirable to use for an electrode board the board which has many holes, and a reticulated thing. Even if it has a hole in using it, opening an interval without sticking an electrode and a diaphragm namely, it is not necessary to have. The material of an electrode board is the board of copper, lead, nickel, chromium, titanium, a tantalum, gold, platinum, an iron oxide, stainless steel, a carbon fiber, or graphite, and what plated or burned the metal of a platinum group to titanium as a material of an anode plate is desirable. Moreover, as a material of a negative plate, you may use high chromium stainless steel (SUS316L) and nickel.
[0036] moreover, in using it, sticking with a diaphragm the electrode board which has many above-mentioned holes The sheet-like non-conducting material which has the hole of a large number which are mostly in agreement with the hole of an electrode board between each electrode board and a diaphragm, For example, a fluorine system resin (brand-name Teflon), ABS plastics, acrylic resin, An epoxy resin, a polyurethane resin, a polyethylene resin, polypropylene resin, A Nylon, a polyethylene-terephthalate resin, polyamide resin, The electrode board which arranges and carried out the laminating of

the sheets, such as elastomers, such as synthetic resin and natural rubber, such as vinylchloride resin, SBR, a chloroprene, and a polybutadiene, or the electrode board with which the electric insulation coat was made to form in a diaphragm side, and many holes opened is used. This electrode board itself is indicated by JP,8-276184,A. Since this electrode board can decrease the phenomenon which the ion generated in respect of the electrode moves to a counter electrode, and the phenomenon which gas stagnates and checks current between an electrode and a diaphragm in order not to make it electrolyze in respect of the electrode of the side which touches a diaphragm, it is desirable. Drawing 1 , drawing 3 , and drawing 5 are the examples which used the electrode board with which many holes of the above-mentioned structure opened. Moreover, in drawing 4 , in order that an electrode board may make a dashboard serve a double purpose, the electrode board with which many holes are not opened is used.

[0037] Moreover, as a diaphragm, they are textile fabrics and nonwoven fabrics, such as polyvinyl-fluoride system fiber, asbestos, glass wool, polyvinyl chloride fiber, polyvinylidene chloride fiber, a polyester fiber, and an aroma group polyamide fiber, as what has water flow nature, for example. Moreover, it is the diaphragm which used textile fabrics and the nonwoven fabric of a polyester fiber, nylon fiber, and a polyethylene fiber for the aggregate, for example, and mixed titanium oxide to film material at a chlorinated polyethylene, a polyvinyl chloride, a polyvinylidene fluoride, or these. Moreover, semipermeable membrane, such as cellophane, or a cation exchange membrane, an anion exchange membrane, etc. are used as a diaphragm with little water flow nature. the electrolysis conditions of this invention -- electrolysis of a small amount -- since the current of a heavy load is passed, very strong acidity and alkaline water are made to generate or high-concentration chlorine gas makes service water generate, it is desirable to choose the diaphragm of the material which can bear the condition

EXAMPLE

[Example] The example using the water electrolyzer shown in example 1 drawing 3 is explained. The size of a cell was 6cm in 15cm long, 9cm wide, and thickness, used platinum / oxidization iridium baking electrode for the having-hole of a large number whose effective area is 2 50cm as electrode board for anode plates (3) titanium board, and used the electrode which carried out platinum plating for the having-to electrode board for cathode (4)-hole of a large number whose effective area is 2 50cm titanium board. The laminating of the fluororesin (Teflon) sheet which is the non-conducting material which has many holes was carried out, and it was used for the diaphragm side of each electrode board. MF film made of a nonwoven fabric was used for the diaphragm (1) of the batch of an anode plate room and a middle room, the cation-exchange-resin film was used for the diaphragm (2) of the batch of a cathode room and a middle room, and the middle room (F) was filled up with sodium chloride solution of about 30% of concentration as an electrolyte. the dashboard (13) by which the anode plate side of a cell was prepared between the side attachment wall (A) and the anode plate (3) -- an anode plate room (D) and a stream -- it divides into a way (G) -- having -- **** -- electrolysis -- the purpose for which an anode plate room (D) lets service water (6) flow, and the water (7) by which electrolysis processing is not carried out cools a cell -- a stream -- a way (G) lets water flow It joins again, and is mixed in the place which came out of the cell, and

both water is discharged from an outlet (8). moreover, the dashboard (14) by which the cathode room side was prepared between the side attachment wall (B) and the negative plate (4) -- a cathode room (E) and a stream -- it divides into a way (H) -- having -- **** -- electrolysis -- the purpose for which a cathode room lets service water (10) flow, in addition service water (11) cools a cell -- a stream -- a way (H) lets water flow, and it joins again, mixes, and is discharged from a

[0039] The direct current which carries out a load to an electrode board is 9.0A, and voltage was made into 6 or 7 volts. the electrolysis duty of water (6) which lets water flow in an anode plate room -- a part for 0.1l./-- setting up -- moreover, a stream -- the amount of water of the water (7) which lets water flow on a way (G) was set as a part for 1.25l./, unification mixture was carried out in the neighborhood which came out of the cell, and the 1.35l. acid electrolysis water for /was obtained The pH value of the obtained acid electrolysis water was 2.68, the ORP value was 1130mV, and the measured value of the free chlorine to contain was 90 ppm. the electrolysis duty of water (10) which lets water flow in a cathode room on the other hand -- a part for 0.1l./-- setting up -- a stream -- the amount of water of the water (11) which lets water flow on a way (H) was set as a part for 0.9l./, unification mixture was carried out in the neighborhood which came out of the cell, and alkaline water was obtained The pH value of the obtained alkaline electrolysis water was 11.54. The current burden of this example electrolysis service water (6) Hits, and is equivalent to 9.0A (5400C/(l.)). Although continuously experimented on these conditions for 48 hours, no scale buildup over cathode was generated. Moreover, the transfusion phenomenon which water moves to cathode from an anode plate was not seen at all. next, the amount of water which lets an anode plate room flow where the pH value of the acid electrolysis water to generate is kept constant and a stream -- various amount of water which lets a way (G) flow was changed, change of a real trial, ORP, and a free-chlorine content was measured, and the transfusion phenomenon was observed The result is shown in Table 1. It turns out that a transfusion phenomenon arises [reduction and the current burden of free-chlorine concentration] in l. in 1350 and 338C /with the increase in the electrolysis duty of water of an anode plate, and the water level of a middle room goes up.

[0040]

[Table 1]

[0041] the same [using the same electrolyzer as an example 1] except having used the electrode board which replaced with a titanium board and platinum / oxidization iridium baking electrode, and gave platinum plating to titanium as an electrode board for example 2 anode plates (3) -- it was operated When the generating effect of the free chlorine at this time was investigated, the result of Table 2 was obtained. High-concentration chlorine generating can be checked from Table 2.

[0042]

[Table 2]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The cross section of an example of the water electrolyzer used by this invention method

both water is discharged from an outlet (8). moreover, the dashboard (14) by which the cathode room side was prepared between the side attachment wall (B) and the negative plate (4) -- a cathode room (E) and a stream -- it divides into a way (H) -- having -- **** -- electrolysis -- the purpose for which a cathode room lets service water (10) flow, in addition service water (11) cools a cell -- a stream -- a way (H) lets water flow, and it joins again, mixes, and is discharged from a

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[0042]

[Table 2]

DESCRIPTION OF DRAWINGS

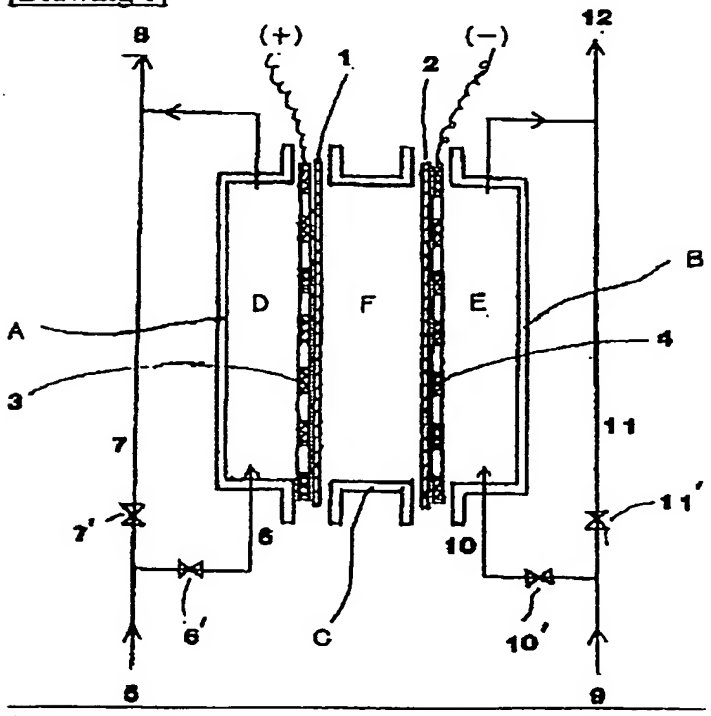
[Brief Description of the Drawings]

[Drawing 1] The cross section of an example of the water electrolyzer used by this invention method

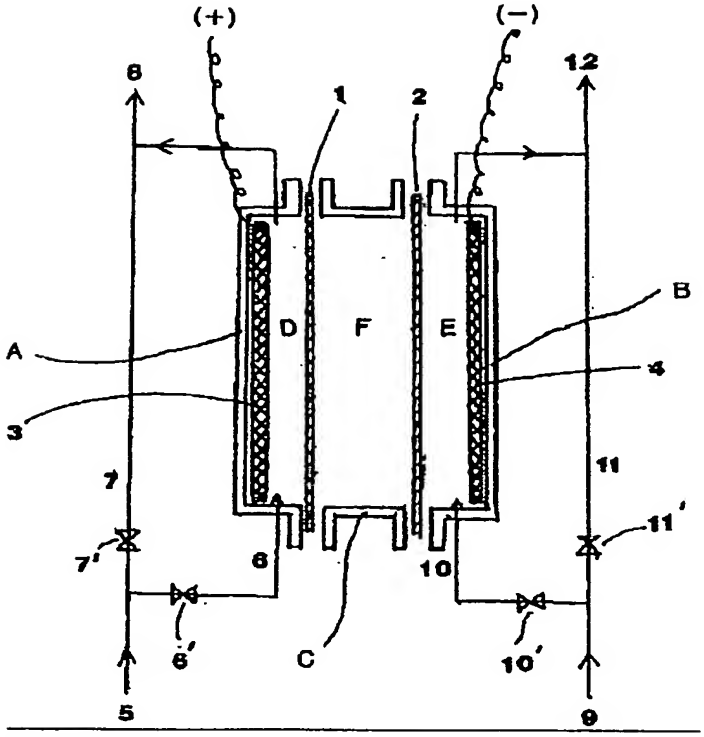
[Drawing 2] The cross section of other examples of the water electrolyzer used by this invention method
[Drawing 3] The cross section of other examples of the water electrolyzer used by this invention method
[Drawing 4] The cross section of other examples of the water electrolyzer used by this invention method
[Drawing 5] The cross section of other examples of the water electrolyzer used by this invention method
[Drawing 6] The cross section of other examples of the water electrolyzer used by this invention method
[Description of Notations]
1 Two 3 A diaphragm, 4 5 An electrode board, 9 13 Raw water, 14 15 A dashboard, 16 An electrolytic solution, A, B, C A cell wall, D An anode plate room, E A cathode room, F A middle room, G, H Style channel

DRAWINGS

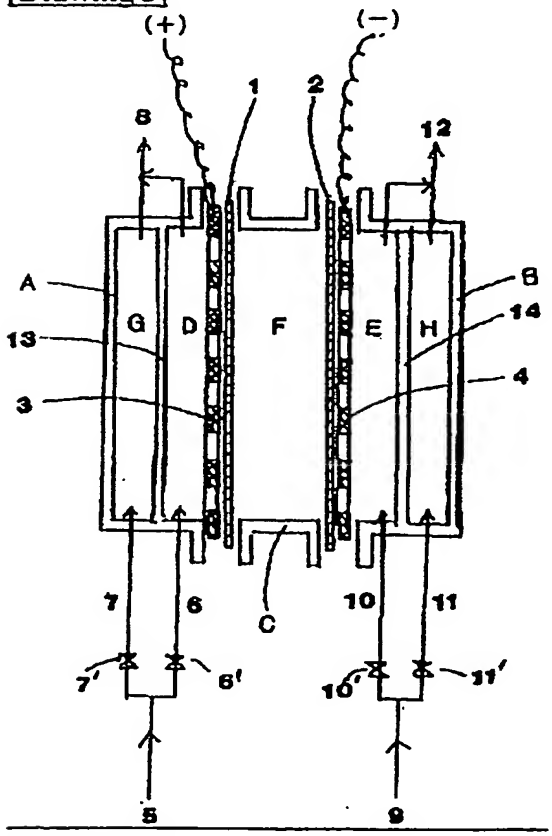
[Drawing 1]



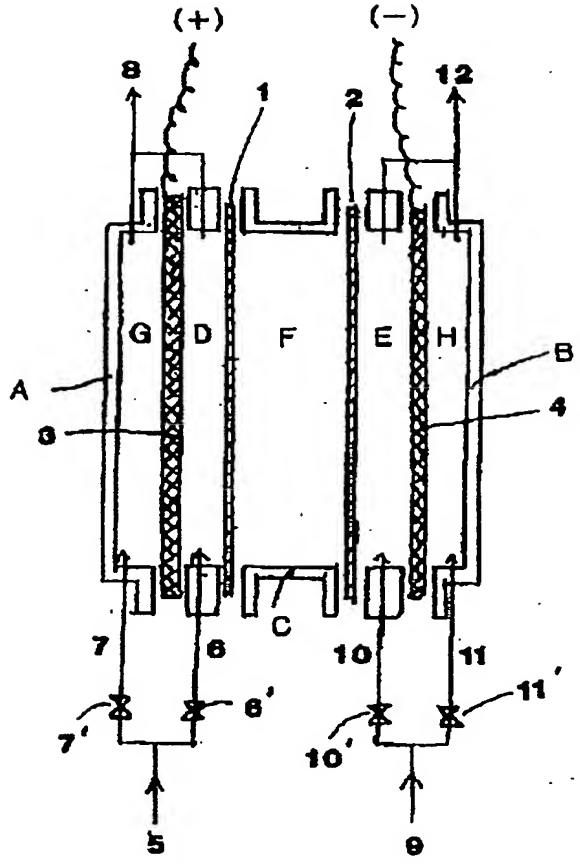
[Drawing 2]



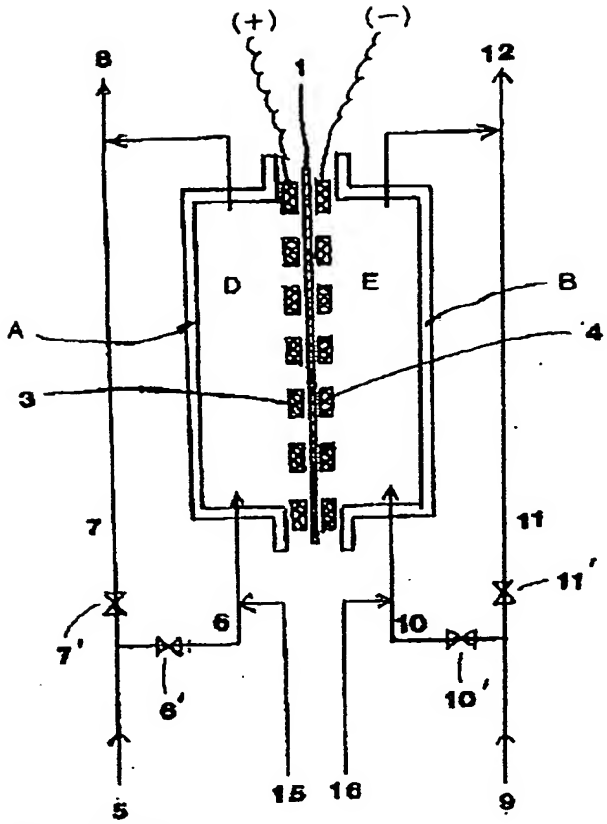
[Drawing 3]



[Drawing 4]



[Drawing 5]



[Drawing 6]